B. Sc.

Program Outcomes

1. To obtain knowledge with facts and figures related to various subjects in basic sciences such as Physics, Chemistry, Botany, Zoology, Mathematics.

2. To understand the fundamental concepts, principles, and scientific theories related to various scientific phenomena and their relevance in daily life.

3. To acquire expertise in handling scientific instruments, planning and performing laboratory experiments with accuracy in observation & logical inferences from it.

4. To aware the faculty and students about environment and sustainability

5. To be able to think innovatively to propose novel ideas in explaining facts or providing new solution to the problems.

COURSE OUTCOME OF PHYSICS FOR UNDERGRADUATE COURSE

B.Sc. I

Paper I (Mechanics and Wave Motion)

1. Understanding the general laws of mechanics and distinguish between central and noncentral forces, conservative and nonconservativeforces .
2. Derive Kepler's laws and motion of planets and satellites.
3. Understand differential equations of simple harmonic motion and its solution.
4. Solve wave equations, plane progressive wave, stationary wave, phase velocity and group velocity.

Paper II (Kinetic Theory of Gases, Thermodynamics and Radiations)

1. The concept of an ideal gas and real gas is applied to understand the various physical phenomenon in the gases like: Mayer's relation, average, rms and most probable velocities of the gases.
2. All the four laws of thermodynamics and concept of entropy is established. Carnot heat engine and Carnot theorem is discussed in great detail.
3. All the four Maxwell's thermodynamic relations are derived and used to obtain the important relations.
4. Kirchoff's law of radiation, Newtons law of cooling is established using the pressure exerted by the radiation formula.
5. Planck's theory of radiation is discussed in wide detail.

Paper III (Circuit Fundamentals and Basic Electronics)

1. Understand the fundamental principles and concepts of growth and decay of currents, charging and discharging in RC, RL and LCR circuits and study of different types of AC Bridges (Maxwell's Schering's and Wien's Bridge), Network theorems(Thevenin's, Norton's and Superposition Theorems) their uses and applications in daily life.
2. Study of semiconductors, types, semiconductor diodes (PN junction, Zener, LED etc.), forward and reverse characteristics of semiconductor diodes and their applications for designing rectifiers, regulated power supply etc.
3. Study about pnp and npn transistors, I/O Characteristics,current gain, voltage gain, power gain of different configurations (CB, CE and CC), amplifiers, concepts of load lines, frequency generators, use

of modulation and demodulations in daily life communication and application of CRO for wave shapes visualisation etc.

B.Sc. II

Paper I (Physical Optics and Lasers)

1. The paper deals with mainly wave nature of light, in which interference, diffraction and polarisation phenomenon of light are discussed in great detail. There are experiments related to these properties of light in the laboratory.
2. The second part discusses about the Laser light, its properties and requirements to produce a laser beam, temporal and spatial coherence and various types of lasers, pumping phenomenon, population inversion and Einstien's coefficients.

Paper II (Electromagnetics)

1. Exposure of the fundamental concepts of electric charges, electric potential and electric field, laws of electricity and magnetism.
2. Study and awareness about Coulomb's law , Gauss's law, Biot-savart law and Ampere's circuital law, their uses and applications.
3. Making clear the concepts of self and mutual Inductions, Faraday's law and Lenz's law, displacement current, Maxwell's Equations, polarization of charges, etc.
4. Generation and applications of electromagnetic waves in medium and Vacuum.

Paper III (Elements of Quantum Mechanics, Atomic Spectra)

1. Understanding the dual nature of matter.
2. Derive Schrodinger time dependent and time independent wave equations
3. LearnHermitian operators, commutation algebra.
4. Understanding the atomic spectra, L-S and J-J couplings, X-rays characteristics.

B.Sc. III

Paper I (Special Theory of Relativity and Statistical Physics)

1. The first part of this paper introduces about Galeian transformations andMichelson-Morley experiment. Lorentz transformations and their consequences in the form of Length contraction, Time dilation and variation of mass with velocitiy and addition of velocities is obtained.
2. Energy momentum relation and famous Einstien mas energy relation is obtained.
3. In the second part of the paper, concept of ensembles and their three fold classification is introduced.
4. Three types of distribution functions MB, BE and FD distributions are obtained using maximum thermodynamic entropy approach.
5. BE distribution is applied to obtain the Planck's law of radiation and Free electron theory of metals is elstablised using FD distribution.

Paper II (Solid State and Nuclear Physics)

1. Understanding the classification of crystal structure, lattice types
2. Derive Braggg's law, Reciprocal lattice vectors and diffraction conditions
3. Understand crystal bondings, modelung energy and evaluation of modelung constant.
4. Understand lattice vibrations in monoatomic and diatomic lattice. Einstein model of heat capacity
5. Hall effect in metal and Kronig-Penney model, effective mass and concept of holes

6. Basic idea of general properties of nucleus, mass defect and binding energy, nuclear forces, and elementary particles

Paper III (Solid state Electronics)

1. Making clear the concept of diffusion of charge carriers in semiconductor, Depletion layer, potential barrier, junction capacitances (Diffusion and Transition), breakdown in diode.
2. To aware the use and applications of Zener and Avalanche diodes, Tunnel diodes, Led and Photodiodes etc.
3. Study about transistor parameters, Feedback in Transistors, equivalent circuit for Transistor (Hybride, Admittance and Impedance equivalent circuits).
4. Study about Transistor amplifiers (Voltage and Power), efficiency, distortion and mode of operations.
5. Study of different types of logic gates(OR, AND, NOT, NOR, NAND, EX-OR and EX-NOR), switching arrangement, Demorgan's laws, K-Map etc.

Practical:

1. Exposure of techniques of handling simple instruments and acquires technical and manipulative skill in using laboratory equipments and tools.
2. Demonstrate an ability to collect data through observations and interpreting data for finding outcomes or results.
3. Acquire or gain the skill of collaborative learning and teamwork in laboratory.
4. Demonstrate understandings of laboratory procedures based on safety and scientific methods.

M. Sc. (Physics)

Program Specific Outcomes

1. The students pursuing this course would have to develop in depth understanding of various aspects of the subject.

2. Understanding basic skills and principles of science by developing and engaging them in life-long learning with effective skills inculcating quality of reasoning,logic, analysis and communication.

3. Ability to work in teams and learn by participating in Technical Events and Social Welfare Programs and develop the attitude for working efficiently as anindividual and in cross- disciplinary teams to become better citizens in multicultural world.

4. Analyze the application of mathematics to problem in physics & development of mathematical method suitable for such application & for formulation of physicaltheories.

5. Understand fundamental theory of nature at small scale & energy levels of atom & subatomic particles

COURSE OUTCOME OF PHYSICS FOR POSTGRADUATE COURSE

M.Sc. Semester-I

Paper I, Course I (Mathematical Physics)

1. The four types of second ordre differential equations, viz., Legendre, Bessel, Hermite and Lagurre are solved and their recurrence relations, Rodrigues formula and generationg functions are discussed.
2. Fourier and Laplace transform and their properties are studied.
3. Complex variable techniques are utilised to evaluate different integrals.
4. Green fuction is also introduced.

Paper II, Course II (Classical Mechanics)

1. Curvilinear coordinates, gradient of a scalar, Divergence and curl of a vector is introduced. Greens, Gauss and Stokes theorems are discussed. Concept of tensor and thrier properties are studied
2. Lagrangian and Hamiltonian dynamics are established with many examples.
3. Canonical transformation and their properties is applied in this paper.

Paper III, Course III (Quantum Mechanics)

1. Solve Schrodinger time dependent and time independent wave equations, stationary states, Dirac Delta function, operators and observables.
2. Solve identical particles, exchange operators, Electron spin hypothesis
3. Concept of Hilbert space, learnHermitian operators, commutation algebra, pure and mixed states.
4. Understanding the theory of angular momentum, ladder operators and C-G coefficients

Paper IV, Course IV(Electronics)

1. Study of Rectifiers, Filters, Regulators, SCR, UJT working principles, I/O characteristics and their applications in consumer Electronics.

2. Study of operational amplifiers , Input and output Offset voltage, biasing current , CMRR, slew rate and application of Op-Amp as Inverting, Non-inverting, Differential, Summer, Integrator and Differentiator amplifiers in day to day life.
3. Exposure of fundamental concepts of Boolean algebra and their algebraic simplification, De-Morgan's Theorems, Universality of NOR and NAND lates, K- map simplification of SOP and POS form of logic expressions, Adder and Subtractor etc.
4. Making clear the concept of FAN IN and FAN OUT, Noise margin and Noise immunity, propagation delay and study about different logic families of RTL, DTL, TTL and ECL and their applications.

M.Sc. Semester-II

Paper I, Course V(Computational Methods and Programming)

1. Various techniques related to evaluation of roots of and equation are applied.
2. Numerical differentiation and integration techniques are used.
3. Numerical techniques to solve the differential equations are also discussed.
4. Above techniques codes in C programming are applied which is also a major portion of the laboratory work.

Paper II, Course VI(Statistical Physics)

1. Concept of ensembles is established. Gibbs paradox, partition function and Sackur-Tetrode equation is introduced.
2. BE condensation, free electron theory of metals is discussed.
3. Brownian motion model and fluctuation properties, Markoff process, Langevin equation, Correlation functions and Dissipation theorems are discussed widely

Paper III, Course VII(Electromagnetic theory and Plasma Physics)

1. Study about Maxwell's equation in micro and macroscopic fields and dielectric Tensor. Scalar and vector potentials, Guage transformation (Lorentz and Transverse).
2. Making clear concepts about propagation of electromagnetic wave in free space, conducting and non conducting medium and study of skin depth, reflection and refraction of electromagnetic wave at an interface as applications. Polarisation of EM wave in Bound medium(Rectangular and circular wave guides), TE, TM and TEM modes
3. Study about matter and plasma state of matter, Motion of charge particles in Uniform and Non- uniform E and B, Plasma confinements, high frequency plasma oscillations etc and their applications.

Paper IV, Course VIII (Atomic and molecular physics)

1. Study the spectrum of Hydrogen and Helium atom, spectra of alkali atoms
2. Hyperfine structure, x-ray spectroscopy, ESR and NMR
3. Study the rotational spectra, vibrational spectra, Isotopic shifs
4. Understand the Ramam spectra, fine structure of the band systems, Frank Condon principle

M.Sc. Semester-III(Special paper)

Paper I, Course IX(Quantum Mechanics II)

1. Schrondinger equation is applied in three dimensional potential problems.
2. Approximate methods viz., Variational methods and WKB methods are applied to solve the problems,
3. Klien-Gordon equation and Dirac equation are discussed for relativistic quantum mechanics
4. Covariance of Dirac equation is established.

Paper II, Course X (Solid state physics)

5. Study the classification of crystal structure,Braggg's law, Reciprocal lattice vectors and diffraction conditions.
6. Basic idea of crystal defects and dislocation
7. Understand the band theory of solids, Bloch theorem
8. Understand lattice vibrations in monoatomic and diatomic lattice.
9. Einstein and Debye theories of specific heat
10. Study optical properties of solids, Kramers-Kronig relations

Paper IV, Course XII(a):(Electronics-I)

1. Making clear the concepts between combinational and sequential logic circuits
2. Study about analog computation, scaling, A/D and D/A converters, Comparators, Codes convertors
3. Study about encoder, decoder, Multiplexers and demultiplexers as combination and Flip-Flops(RS, JK, MSJK, D and T), Registers(Left-shift, Right- shift, Universal Shift) and Counters(Up, Down, Ring, Twisted ring as sequential logic circuits.
4. Gain the knowledge of different types of memories(RAM, ROM, PROM, EPROM, EEPROM) and study about 8085 microprocessor architecture, instructions, programming for doing specific task.

M.Sc. Semester-IV

Paper I, Course XIII:(Electrodynamics)

1. Postulates of special theory of relativity is revisited in four dimensional notation.
2. Electromagnetic Field tensor is introduced nad transformation properties of electric and magnetic field is studied.
3. Invariants of electromagnetic field are obtained
4. Radiations from a rapidly moving charge is obtained

Paper II, Course XIV (Modern optics)

1. Study the nonlinear optics, nonlinear polarizability tensors, second harmonic generations
2. Understanding quantum optics, spatial and temporal coherence, quasi phase distribution functions
3. Learn types of fibers, single and multimode fibers, dispersion and loss in the fibre.
4. Study the basic principle of holography, recording and reconstruction, applications of holography

Paper III, Course XV-1 (Nanoscience and sensor technology)

1. Study the properties of nanomaterial, quantum dots and applications of nanomaterials
2. Study synthesis of graphene, preparation of quantum nanostructures, density of states
3. Learn different types of nanoparticles synthesis
4. Study the physics of sensor technology, MOS sensor, Thick/Thin film gas sensors

Paper IV, Course XVI(a):(Electronics-II)(Special paper)

1. Making clear the concepts of Noise, S/N ratio, transmission of information through discrete channels and channel capacity, Sampling, transmission and detection of signals (Analog and Digital).
2. Study about Analogmodulation(PAM, PPM,PWM) and Digital modulation (PCM,DPCM,DM,ADM).
3. Study of microwaves generating devices: Gun diode, Tunnel diode, IMPATT and woking principles of antenna (dipole, short electric dipole, linear and ground, antenna arrays.

Practical:

1. Exposure of techniques of handling simple instruments and acquires technical and manipulative skill in using laboratory equipments and tools.
2. Demonstrate an ability to collect data through observations and interpreting data for finding outcomes or results.
3. Acquire or gain the skill of collaborative learning and teamwork in laboratory.
4. Demonstrate understandings of laboratory procedures based on safety and scientificmethods.

Instructors

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